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CLAIMS

1. A lift axle suspension system for selectively raising an axle (18) and the attached wheel assemblies of a vehicle out of engagement with a road surface for use with vehicles (12) of the type having a longitudinally extending frame member (14) on either side of the vehicle, said system comprising with respect to each frame member:

a mounting bracket (50) rigidly affixed to a longitudinally extending frame (14) member on the vehicle;

a first (62) and a second (64) articulating arm each having first and second ends, the first end (86) of each articulating arm being pivotally attached to the mounting bracket, and the second end (86) of each articulating arm being pivotally attached to the axle (66); and

at least one diaphragm chamber (122) having a movable wall (142) therein dividing the diaphragm chamber into an upper chamber (144) and a lower chamber (146), and a push rod (136) extending therefrom and translatable when the movable wall is moved whereby the push rod is interconnected to the lift axle suspension system in a manner such that translation of the push rod causes pivotal movement of the articulating arms and axle attached thereto.

2. The lift axle suspension system of claim 1 wherein the at least one diaphragm chamber has a first and a second diaphragm chamber, and wherein

152

the movable wall in each diaphragm chamber includes a flexible bladder separating the lower chamber from the upper chamber which is adjustably pressurized to move the movable wall.

3. The lift axle suspension system of claim 2 wherein the diaphragm chambers are brake chambers wherein each movable wall is a rigid plate with the flexible bladder at least therearound flexibly and sealingly separating the upper and lower chambers.

4. The lift axle suspension system of claim 2 wherein each diaphragm chamber is provided with an air inlet 170 for pressurizing the upper chamber which forces the flexible bladder toward the lower chamber thereby pushing the push rod.

134, 132

5. The lift axle suspension system of claim 2 further including a pivot arm pivotally connected to a distal end of each push rod.

6. The lift axle suspension system of claim 5 wherein the pivot arms are pivotally connected together.

7. The lift axle suspension system of claim 5 wherein the pivot arms are pivotally connected about one of the pivotal attachments of the articulating arms to the mounting bracket.

8. The lift axle suspension system of claim 2 wherein the first diaphragm chamber is mounted in a pivotal manner while the second diaphragm chamber is mounted in a fixed manner.

9. The lift axle suspension system of claim 7 wherein the first diaphragm chamber is rigidly mounted to the pivotally mounted first articulating arm, while the second diaphragm chamber is rigidly mounted to the mounting bracket.

10. The lift axle suspension system of claim 5 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

11. The lift axle suspension system of claim 10 wherein the first diaphragm chamber is rigidly mounted to the mounting bracket while the second diaphragm chamber is rigidly mounted to the pivot arm.

12. The lift axle suspension system of claim 2 further including a pivot arm with the first and second diaphragm chambers connected thereto, while the push rod for the first diaphragm chamber is pivotally connected to the mounting bracket and the push rod for the second diaphragm chamber is pivotally connected to one of the articulating arms.

13. The lift axle suspension system of claim 12 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

14. The lift axle suspension system of claim 2 further including axle connector bracket rigidly affixed to the axle, and the push rod for the first diaphragm chamber is pivotally connected to the mounting bracket and the push rod for the second diaphragm chamber is pivotally connected to the axle connector bracket.

15. The lift axle suspension system of claim 2 further comprising an axle connector bracket rigidly affixed to the axle and including a first pair of spaced apart walls in which a first end of the articulating arms are pivotally affixed, and

wherein the mounting bracket includes a second pair of spaced apart walls in which a second end of the articulating arms are pivotally affixed.

16. The lift axle suspension system of claim 2 further comprising a pivot at the first and second ends of the articulating arms, the pivot including a pin at least partially encapsulated by a dampening material that is at least partially encapsulated by the articulating arm.

17. A lift axle suspension system for selectively raising an axle and the attached wheel assemblies of a vehicle out of engagement with a road surface for use with vehicles of the type having a longitudinally extending frame member on either side of the vehicle, said system comprising with respect to each frame member:

articulating means pivotally attaching the axle to the vehicle;

translation means for pushing the articulating means to pivot; and

drive means affixed to the translation means and movable by pressure adjustments to the atmosphere adjacent the drive means.

18. The lift axle suspension system of claim 17 further comprising mounting means rigidly affixed to a longitudinally extending frame member on the vehicle and pivotally attached to the articulating means.

19. The lift axle suspension system of claim 18 further comprising a pair of diaphragm chambers each including the drive means comprised of an upper and lower chamber divided by a pressure sensitive movable wall, and translation means comprised of a push rod affixed to and translatable when the movable wall encounters pressure changes in one of the adjacent upper and lower chambers wherein the push rod is interconnected to the articulating means in a manner such that translation of the push rod causes pivotal movement of the articulating means and axle attached thereto.

20. The lift axle suspension system of claim 19 wherein the diaphragm chambers are brake chambers wherein each movable wall is a rigid plate with the flexible bladder at least therearound flexibly and sealingly separating the upper and lower chambers.

21. The lift axle suspension system of claim 19 wherein each diaphragm chamber is provided with an air inlet for pressurizing the upper chamber which forces the flexible bladder toward the lower chamber thereby pushing the push rod.

22. The lift axle suspension system of claim 21 further including a pivot arm pivotally connected to a distal end of each push rod whereby the pivot arms

are pivotally connected together about one of the pivotal attachments of the articulating arms to the mounting bracket.

23. The lift axle suspension system of claim 21 wherein the first diaphragm chamber is mounted in a pivotal manner while the second diaphragm chamber is mounted in a fixed manner.

24. The lift axle suspension system of claim 22 wherein the first diaphragm chamber is rigidly mounted to pivotally mounted first articulating arm, while the second diaphragm chamber is rigidly mounted to the mounting bracket.

25. The lift axle suspension system of claim 22 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

26. The lift axle suspension system of claim 25 wherein the first diaphragm chamber is rigidly mounted to the mounting bracket while the second diaphragm chamber is rigidly mounted to the pivot arm.

27. The lift axle suspension system of claim 21 further including a pivot arm with the first and second diaphragm chambers connected thereto, while the push rod for the first diaphragm chamber is pivotally connected to the mounting bracket and the push rod for the second diaphragm chamber is pivotally connected to one of the articulating arms.

28. The lift axle suspension system of claim 27 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

29. The lift axle suspension system of claim 21 further comprising a pivot at the first and second ends of the articulating arms, the pivot including a pin at least partially encapsulated by a dampening material that is at least partially encapsulated by the articulating arm.

30. A method of selectively raising an axle and the attached wheel assemblies of a vehicle out of engagement with a road surface for use with vehicles of the type having a longitudinally extending frame member on either side of the vehicle, said method comprising with respect to each frame member:

pressurizing of an upper chamber in at least one diaphragm chamber having a movable wall therein dividing the diaphragm chamber into a pressurizable upper chamber and a lower chamber;

translating of a push rod extending from the diaphragm chamber and translatable when the movable wall is moved by pressure increases in the upper chamber whereby the push rod ;

articulating of at least one of a first and a second articulating arm where the push rod is attached to at least one of the first and second articulating arm;

pivoting of the lift axle out of engagement with the road surface where a first end of each articulating arm is pivotally attached to a mounting bracket rigidly affixed to the vehicle frame, and a second end of each articulating arm is pivotally attached to the axle.

31. The method of claim 30 wherein the diaphragm chambers are a pair of brake chambers.

32. The method of claim 31 pivoting of pivot arms connected to a distal end of each push rod and pivotally connected together.

33. The method of claim 31 wherein the first diaphragm chamber is mounted in a pivotal manner while the second diaphragm chamber is mounted in a fixed manner.

34. The method of claim 31 wherein the first diaphragm chamber is rigidly mounted to pivotally mounted first articulating arm, while the second diaphragm chamber is rigidly mounted to the mounting bracket.

35. The method of claim 31 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

36. The method of claim 35 wherein the first diaphragm chamber is rigidly mounted to the mounting bracket while the second diaphragm chamber is rigidly mounted to the pivot arm.

37. The method of claim 31 further including a pivot arm with the first and second diaphragm chambers connected thereto, while the push rod for the first diaphragm chamber is pivotally connected to the mounting bracket and the push

rod for the second diaphragm chamber is pivotally connected to one of the articulating arms.

38. The method of claim 37 wherein the first and second articulating arms include extensions extending beyond the arms pivotal connection to the mounting bracket and in a direction generally opposite the arm direction toward the axle connection, and where the first and second articulating arms are pivotally connected to the pivot arm.

39. The lift axle suspension system of claim 38 further including axle connector bracket rigidly affixed to the axle, and the push rod for the first diaphragm chamber is pivotally connected to the mounting bracket and the push rod for the second diaphragm chamber is pivotally connected to the axle connector bracket.